

Agenda for TTCP HUM TP9 Workshop:
*The Insertion of Human Factors into the Acquisition
Process for Naval Systems*
5-6 June 2000
DCIEM, Toronto, Canada

Workshop Day 1—Monday, 5 June 2000

<u>Time</u>	<u>Presentation/Venue</u>	<u>Presenter</u>
0830-0840	Welcome & Introductions	Chairman, HUM TP9
0840-0850	Opening Address	Director General, DCIEM, CA

Topic 1: Human Factors Integration (HFI)/Human Systems Integration (HSI) in Policy & Practice: An Overview to National Programmes

<u>Time</u>	<u>Presentation/Venue</u>	<u>Presenter</u>
0850-0920	Australian Perspective	AS National Leader, HUM TP9
0920-0950	Canadian Perspective	Two participants from Canada
0950-1000	Break	All
1000-1030	UK Perspective	Directorate of Naval Manning, UK
1030-1100	US Perspective	US Member, HUM TP9
1100-1130	UK/US Technology for Optimized Manning (TOM) Initiative	US Member, HUM TP9
1130-1200	Group Discussion on Topic 1	All
1200-1330	Lunch	All

Topic 2: HFI/HSI Capability Maturity Models & Assessment Techniques

<u>Time</u>	<u>Presentation/Venue</u>	<u>Presenter</u>
1330-1415	UK Human Factors Capability Maturity Model	UK National Leader, HUM TP9
1415-1500	Bridge cards: A method for ensuring the 'right' HSI questions are asked by senior management	NAVSEA Dahlgren, US
1500-1515	Break	All
1515-1600	Group Discussion on Topic 2	All
1600	Adjourn	

Workshop Day 2—Tuesday, 6 June 2000

Topic 3: Tools and Technologies to Support HFI/HSI in the Acquisition Process

<u>Time</u>	<u>Presentation /Venue</u>	<u>Presenter</u>
0830-0900	Manning affordability & HSI in the Canadian Afloat Logistics & Sealift Capability ship	Canadian Member, HUM TP9
0900-0930	Early Human Factors Analysis Tool	UK Member, HUM TP-9
0930-1000	Intelligent Computer-aided Design System for Ships Operating Spaces (HFE/ICADD): Re-hosting from SGI workstation to a desktop PC environment	Participant, Options Inc. Participant, Protogon Inc.
1000-1015	Break	All
1015-1045	Update on HSI Standards, Models & Tools for US Navy ship acquisitions	Mr. Dennis White, BCI Inc., US
1045-1115	Update on/demo of Mission Manpower Model (PC Version)	Australian National Leader, HUM TP9

Workshop Day 2—Tuesday, 6 June 2000 (cont'd)

<u>Time</u>	<u>Presentation /Venue</u>	<u>Presenter</u>
1115-1200	Group discussion on Topic 3 Workshop wrap-up	All
1200-1330	Lunch	All
1330-1600	Tour of DCIEM facilities	Canadian National Leader, HUM TP9
1600	Adjourn	

ABSTRACTS FOR WORKSHOP PAPERS

Day 1, Topic 1: Human Factors Integration (HFI)/Human Systems Integration (HSI) in Policy & Practice: An Overview to National Programmes

Title: HFI/HSI in Policy and Practice: Australian Perspective

Presenter: Participant, Maritime Platforms Division, DSTO

Abstract: Whilst the policy of the Defence Acquisition Organisation states that appropriate standards shall be applied in the application of HSI/HFI to naval acquisition projects, the application of such standards has varied from project to project. Projects such as the Offshore Patrol Combatant and the Huon class minehunter are examples where issues such as crew size, workload and HMI issues were successfully addressed in the development and acquisition phases of the project. Other acquisition projects have not been so successful in the HSI/HFI area. This situation appears to be changing within the Royal Australian Navy and associated groups with the Australian Defence Organisation due to:

- The 'new' navy organisation based along Force Element Groups (FEG), with each FEG commander responsible for delivering total capability within the FEG.
- The growing acceptance within each FEG of the critical importance of getting the HSI/HFI equation correct.
- The creation of the Navy Systems Command, with specific reference to HFI.
- Increased R&D effort within DSTO in HSI/HFI.

Day 1, Topic 1: Human Factors Integration (HFI)/Human Systems Integration (HSI) in Policy & Practice: An Overview to National Programmes

Title: HFI/HSI in Policy & Practice: Canadian Perspective

Presenters: Participant, Defence R&D Canada HQ, DSTHP 3, Ottawa Ontario; Participant, Options Inc. Consultants Waterloo, Ontario, and Participant, Defence & Civil Institute of Environmental Medicine Toronto Ontario, Canada

Abstract: In response to requests from personnel in the Department of National Defence (DND) and from acquisition projects of the Canadian Forces, Defence Research and Development Canada (DRDC) has recently put together the elements of a centralized HSI Program and Support Team in DND. This program is being coordinated by the DRDC but requires the input and participation of a number of stakeholders. At this time in Canada, the demand for such an approach is increasing, particularly with the inclusion of HSI as a key theme in the new formal DND “Guidelines for the Preparation of a Statement of Operational Requirements”, the key initial document for Material Acquisition and Support (MA&S) in DND.

The initiative that DRDC is coordinating has three primary components: 1) people, 2) process, and 3) tools. “People” refers to HSI resources throughout DND, including representatives from directorates responsible for each HSI Domain. “Process” refers to a recommended analysis process for acquisition and support projects to ensure that HSI is properly integrated into future materiel systems. “Tools” refers to modeling, simulation and analysis tools used in the HSI process, many of which already exist throughout DND, such as Safework, HEART, SOLE IPME, HFE Guide, HFE ICADD, etc.

The DRDB HSI initiative has not been designed with an attempt to combine or alter the current responsibilities of the different disciplines or HSI domains. Instead, the intent of the present approach is: 1) to better integrate these disciplines into the mainstream of the MA&S process; 2) to better integrate common aspects of each domain’s analysis, and; 3) to better integrate HSI related R&D activities. The aim is for all domains to be involved earlier in the acquisition cycle and for all to be kept current as project assumptions change throughout the cycle.

To further facilitate this integration, DRDB has established an HSI Web Site to provide information and visibility to both project personnel and the HSI community. The Web site will identify personnel currently responsible for Training as the Training experts, HFE personnel will be indicated as the HFE experts, etc. HSI Case Studies or examples are being documented to illustrate the successful application of HSI and to gather data on related costs saved and costs avoided. DRDC has taken on this HSI Program approach and role through requests from DND acquisition project personnel, who have consistently indicated that a centralized program of this nature is required. In conclusion, we believe that such a centralized HSI approach with a virtual HSI Support team in DND can ensure an optimal consideration of human factors as well as an optimal integration and re-use of models, simulations and analyses between the various HSI domains.

Day 1, Topic 1: Human Factors Integration (HFI)/Human Systems Integration (HSI) in Policy & Practice: An Overview to National Programmes

Title: HFI/HSI in Policy & Practice: UK Perspective

Presenter: This presentation was given by a representative of the Directorate of Naval Manning, UK, with the assistance of Defence Evaluation and Research Agency (DERA) & Defence Procurement Agency (DPA) Sea Technology Group, UK; DERA Centre for Human Sciences, UK, DERA & DPA Future Business Group, UK.

Abstract: This paper examines HFI in the UK context from both ‘top down’ and ‘bottom-up’ perspectives. The former involves reviewing strategic developments in HFI, the latter examining the experience of those involved in application of HFI within individual projects.

At the strategic level the move to acquiring military capabilities, rather than purely equipment, makes consideration of human issues from the earliest stages increasingly critical. UK MOD is currently introducing Smart procurement. We have used this as an opportunity to reassess HFI processes and learn from experience over the last 9 years. A number of key lessons have been learnt; firstly, there was an implicit assumption that all equipment projects would have their own specialist ‘in-house’ HFI practitioner. With 800 projects and only a very small number of specialists this was a major barrier to the comprehensive application of HFI.

Secondly, it was apparent that if HFI was viewed as being “owned” by the HF community difficulties arose in gaining acceptance by projects. To address these problems responsibility for managing/ developing project specific HFI strategies and plans has been passed to project staff. Projects are now required to nominate an HFI focus within the core team, although this will not normally be a HF practitioner. These foci are responsible for coordinating HFI activities across the programme, for ensuring that key stakeholders, including end users and industry, are involved and consulted throughout the procurement process. The IPT is given the responsibility for managing HFI but they are encouraged to seek HFI advice as they see necessary. Experience suggests that this is increasing rather than decreasing the role and status of practitioners.

The third lesson learnt is that non-specialist staff may carry out some HFI activities. These activities have been identified and techniques developed to support staff involved in these activities. This has required the redefinition of the Target Audience for many HFI products and a series of workshop have been held to assist in the validation of this new approach. This has involved the use of mock CWGs/IPTs who employed the emerging HFI guidance in the context of ‘hypothetical’ procurement programmes. Mechanisms have now been put in place within the MoD to provide a focus for HFI within acquisition. Supporting activities have been undertaken to develop guidance for HFI in capability management and the management of HFI throughout acquisition. The guidance is to be issued through a newly developed HFI web site that is integrated within the MoD’s Acquisition Management System (AMS).

From the perspective of the Naval end user it is evident that the Royal Navy has an ambitious equipment acquisition programme ahead of it, seemingly ever more challenging budgets,

diversifying roles and a potentially volatile human resource base. Capability Management, a post SDR Operational Doctrine and set of Tasks, "Smart" procurement, and the discipline of HFI, informed by quality research, comprehensive Operational Analysis and Costing methodologies should combine to ensure that the role of the human is properly considered. Practice never quite equates to theory immediately but the Royal Navy is aiming to ensure that the need to meet and sustain the appropriate level of human effort, at both the local and strategic level, in delivering the desired operational output is properly understood and embodied within programme planning. The end user is becoming far more involved in procurement at an early stage. The Directorate of Naval Manpower's Strategic Manpower Review is about to commence in earnest. Considerable effort is being applied to design a framework for capturing Manpower and Human Factors "Requirements" in a rigorous, irrefutable and assessable manner within the framework of the UK's HFI process.

Day 1, Topic 1: Human Factors Integration (HFI)/Human Systems Integration (HSI) in Policy & Practice: An Overview to National Programmes

Title: HFI/HSI in Policy & Practice: US Perspective

Presenter: Director, Optimal Manning Program, Program Executive Office
Surface Strike, PEO (S)-M, Arlington, Virginia

Abstract: Earlier this year the Assistant Secretary of the Navy for Research, Development, and Acquisition, announced the reorganization of the Program Executive Office for DD 21 and its re-designation as the Program Executive Office for Surface Strike—PEO (S). Coincident with this reorganization, the Director was transferred from his position as Head, DD 21 Manning/Human Systems Integration Department to Director, Optimal Manning Program within PEO (S). This paper reviews FY99-00 progress in implementing and institutionalizing HFI/HSI processes for US Navy surface combatants. A noteworthy development in this connection has been the formation of a Policy Clearinghouse (PCH) to provide a mechanism for identifying manpower, personnel, and training (MPT) issues that are tied to Navy policy, statute, procedure, and culture. Inputs to the PCH will be solicited from interested parties using a web-based, global network. The Policy Working Group, one of three integrated product teams supporting the DD 21 Manning/HSI organization, will manage the PCH, ensuring that MPT issues are not only collected, but also assessed and resolved.

Day 1, Topic 1: Human Factors Integration (HFI)/Human Systems Integration (HSI) in Policy & Practice: An Overview to National Programmes

Title: UK/US Technology for Optimized Manning (TOM) Initiative

Presenter: Naval Undersea Warfare Center, Newport, Rhode Island

Abstract: This presentation provides an overview to a bilateral (US/UK) initiative known as TOM—Technology for Optimized Manning. The TOM effort is focusing on application of existing and emerging technology to support optimized manning for naval platforms with service entry dates between 2010-2020 (i. e., post-FSC, DD 21). A history of the initiative, along with progress to date and plans for UK/US workshops to address the following themes: Future Battlespace and Technology, Personnel and Future Systems, Human System Integration and Technology, and Whole Ship Integration, will be discussed. Because this approach to future ship design and development is driven by manning issues and advanced technology, end products are expected to provide more freedom to pursue innovative solutions of long-term benefit to the Navy and Marine Corps. Summaries and points of contact will be provided for other US Navy Manning Optimization and Human Factors Integration programs, several of which involve bilateral UK/US collaboration.

Day 1, Topic 2: HFI/HSI Capability Maturity Models & Assessment Techniques

Title: UK Human Factors Capability Maturity Model

Presenter: This presentation was given by the UK National Leader to HUM TP9, DERA, Centre for Human Sciences, UK.

Abstract: This presentation reports on work undertaken by DERA CHS, Lloyds Register of Shipping and Process Contracting Ltd . Human Factors Integration (HFI) sets out to deliver operable (i.e. effective, productive, safe and satisfying) systems. A Human Factors Integration Capability Maturity Model (HFI CMM) is an objective, structured way of providing assurance of operability and effectiveness before project resources are committed. An effective CMM requires the following: an established process model; an established assessment model; a strategy for procurement intervention and support; together with appropriately trained specialists. The CMM provides a mechanism for improving HFI processes and a means of mitigating project risk.

The proposed HFI CMM has two main technical components (a process model and an assessment scheme) and an implementation strategy for technical validation and operation in support of procurement. The process model is based on established HFI guidance and industrial best practice. HFI research is currently assembling a set of HFI processes that can be integrated into procurement activity. This provides a sound basis for an HFI CMM tailored to MoD's new Smart Procurement Initiative.

Day 1, Topic 2: HFI/HSI Capability Maturity Models & Assessment Techniques

Title: Bridge Cards: A Method for Ensuring the 'Right' Human Factors Questions Are Asked by Senior Management

Presenter: Section Head, Human Centered Systems
Engineering Section, NAVSEA Dahlgren, Dahlgren, Virginia

Abstract: In nautical history, a Bridge Card was prepared to assist a ship's Commanding Officer (CO) in establishing the seniority of participating units in a battle group by listing the lineal number (i.e., rank) of each participating units' CO. This concept has been extended over the years to include a variety of lists that enable the CO to "come up to speed" quickly when confronted with unfamiliar or changing circumstances. More recently, the RADM Program Executive Office, Theater Surface Combatants (PEO TSC-T) requested that Bridge Cards be developed to address human factors and human-systems integration (HFI/HSI) issues for existing vessels and new platform acquisitions. This paper presents and discusses two sets of Bridge Cards, developed collaboratively by the section head and Basic Commerce and Industries (BCI) Inc., Dahlgren, Virginia, in support of the RADM request. The first is titled Human Factors Top Ten Bridge Card; the second, and more comprehensive Bridge Card, is titled List of Interoperability, Integration and Human Factors Questions for Acquisition Milestones.

Day 2, Topic 3: Tools and Technologies to Support HFI/HSI in the Acquisition Process

Title: Manning Challenges for the Afloat Logistic & Sea Lift Capability Ship

**Presenter: Systems Engineer - Naval Human Factors,
Directorate Maritime Ship Support, National Defence Headquarters,
Ottawa**

Abstract: Manning for the Afloat Logistic and Sealift Capability (ALSC) Ship must satisfy a variety of mission requirements, some of which are new to the Canadian Navy. The methodology used to study manning is based on the basic premise that Manning is determined by the allocation of functions to hardware, software, personnel or off-board (including combinations) early in the design phase. Allocation of functions should primarily be based on costs; the total cost of human execution of a function includes the system life cycle cost of the trained operators, maintainers and supervisors who are required to perform the function. The presentation will discuss how this basic premise is being applied to a study of manning for ALSC.

Day 2, Topic 3: Tools and Technologies to Support HFI/HSI in the Acquisition Process

Title: **Early Human Factors Analysis Tool**

Presenter: This presentation was given by the UK Member to HUM TP-9,
DERA, Centre for Human Sciences, UK

Abstract: Research within the MoD Corporate Research Programme has been seeking to improve the process by which Human Factors considerations are integrated into the procurement of defence equipment. The process resulting from this work is known as Human Factors Integration (HFI). Early application of HFI is crucial to ensuring issues in this area are effectively covered in Requirements documents and the project approval process. Part of the HFI research has been concerned with developing a method to assist in identifying the key human related issues that a procurement programme needs to consider. An important aim is to improve the design of future equipment by feeding forward lessons learned from both in-service equipment and about the process of procuring new equipment. The work has produced a number of products to date. One of these is the subject of this presentation: a simple, intuitive process known as the Early Human Factors Analysis (EHFA). EHFA is a process to help projects identify and assess human related risk. Human risks can include issues such as the ease of using or maintaining equipment, the number and type of people required, health and safety or training and maintenance costs. EHFA is intended to be simple and intuitive. It is closely associated with risk management and requirements engineering and is readily integrated with standard project management practice. EHFA is particularly powerful when projects are first starting up as it structures thinking about issues and risks, and provides input to project planning and risk management.

Day 2, Topic 3: Tools and Technologies to Support HFI/HSI in the Acquisition Process

Title: Intelligent Computer-aided Design System for Ships' Operating Spaces (HFE/ICADD): Re-hosting from SGI Workstation to a Desktop PC Environment

Presenters: Participant, Options Inc., Guelph, Ontario, and
Participant, Protogon Inc., Ottawa, Ontario, Canada

Abstract: Throughout the 1990's DCIEM conducted a project to develop the Human Factors Engineering Intelligent Computer Aided Design and Drafting (HFE/ICADD) software program. The tool, which was briefed to TTCP HUM TP9 during the 1996 meeting, was designed to assist the human factors engineer with the review of ship spaces, and the management of ship space reviews. HFE/ICADD was created through the integration of some commercial software products with custom developed software on a Silicon Graphics computer. A recent investigation has proposed a way-ahead to transfer the functionality of HFE-ICADD to the PC-based Information Technology environment now established within the Department of Defence. One goal is to use as many commercially available products as possible. Another goal is to further integrate the human factors requirements management role into the core project requirements work stream as set down by the Department's Directorate of Business Change Management. This paper will summarize the new concept for HFE/ICADD in the naval acquisition and development environment and discuss how it is proposed to implement HFE-ICADD as a PC-based software system. The paper will also outline how the same concept may be applied to other large procurement projects.

Day 2, Topic 3: Tools and Technologies to Support HFI/HSI in the Acquisition Process

Title: Update on HSI Standards, Models & Tools for US Navy Ship Acquisitions

Presenter: Participant, Basic Commerce and Industries, Inc., Superior, Colorado

Abstract: This paper provides an update on the status of efforts within the US Navy to implement Human System Engineering Models, Tools, Methods, and Standards from a designer's and an evaluator's perspective. Programs to be discussed include the ONR/SC-21 S&T Manning Affordability Initiative (MAI), which includes Thrust 3—the Human Centered Design Environment (HCDE), Ship Manpower and Analysis Tool (SMART), and Ship System HSI for Affordability and Performance Engineering (SHIPSHAPE) efforts. It will also include an update on work by the HCDE team to include a human-centered engineering process within extant systems engineering process standards; namely: IEEE 1220, ISO 15288 and the International Counsel on Systems Engineering (INCOSE) Systems Engineering Handbook.

Day 2, Topic 3: Tools and Technologies to Support HFI/HSI in the Acquisition Process

Title: The Mission Manpower Model - Recent Developments

Presenter: Participant, DSTO, Australia

Abstract: The Mission Manpower Model (MMM) is a software design tool which tests ship missions against a complement, system/equipment fit and resource pool. Deficiencies and overloading of personnel, systems and resources are identified by simulating each mission, producing detailed mission task schedule graphs, usage charts and error reports. Typical uses of the MMM include:

- Reducing complement requirements through automation.
- Determining optimal system/equipment fits.
- Determining maximum resource loads.
- Sensitivity analysis of ship design parameters.
- Determining training requirements for new designs and/or equipment.
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The MMM has recently been ported to a Windows environment, with many enhancements including improved user interface and operating environment, Access database and integration with a MapInfo Geographic Information System. The new version of the MMM, known as the Ship Resource Simulation Model (SRSIM), will be demonstrated and future development plans will be outlined.